

d) a fourth portion interposed between said first and said second portions, wherein said first, second, third, and fourth portions consist essentially of polysilicon, tantalum, platinum, and titanium silicide.

REMARKS

In response to the Office Action mailed on December 8, 2000, applicant cancels claims 28-38 without prejudice or disclaimer; amends claims 39, 48, 51, and 56; and adds new claims 88-92. The amendment to claims 39, 48, 51, and 56 find support at least in one or more of Figures 26-28.

Applicant reserves the right to later address any tacit or explicit characterization of the references to the extent the following remarks do. Additionally, applicant reserves the right to swear behind any of the cited references.

Response to Request for Drawing Changes

The Examiner stated that "Figure[s] 1-11 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated." Applicant notes that the background of the application describes Figure 1 and that this figure bears the legend "Related Art." Applicant does not admit that Figures 2-11 constitute prior art and therefore respectfully requests that the Examiner withdraw the request to label these drawings as such.

Response to §112 Rejections

In the Action, the Examiner rejected claims 28, 31, 34, 39, 48, 51, and 56 under 35 USC § 112, first paragraph, as containing subject matter which was not described in the specification, asserting specifically that the specification and drawings do not support recitation of "the third portion overlying second portion and a portion of insulative layer."

In response, applicant submits that this recitation is supported at least by Figures 9A, 9B, 10A, 10B, 11A, 11B, and 15, all of which exemplarily show insulative layer 40, polysilicon plug 65, tantalum layer 75, and platinum layer 85. Platinum layer 85 overlies tantalum layer 75 and at

least a portion of insulative layer 40. Accordingly, applicant respectfully request reconsideration and withdrawal of the 112 rejection of claims 28, 31, 34, 39, 48, 51, and 56.

The Examiner also rejected claims 42-43 and 57 under 35 USC § 112, first paragraph, as containing subject matter which was not described in the specification, asserting particularly that the specification and drawings lack support for the recitation of “fourth portion interposed between said first and said second portions” in claim 42, “fourth portion reduces contact resistance between first and second portion” in claim 43, and “a reducing contact resistance portion interposed between said contact and diffusion barrier portion” in claim 57.

In response, applicant submits that this recitation is supported at least by Figures 25 and 26, which exemplarily show insulative layer 40, polysilicon plug 65, tantalum layer 75, platinum layer 85, along with a titanium silicide layer 105. The specification as amended by page 8 of the Preliminary Amendment of December 14, 1995, states that “[t]he titanium silicide layer lowers contact resistance between the polysilicon plug 65 and the TiN layer 75.” Accordingly, applicant respectfully request reconsideration and withdrawal of the 112 rejection of claims 42-43 and 57.

Response to §102 Rejections

Claims 28-41, 44-46, 46 and 48-56 were rejected under 35 USC § 102(b) as being anticipated by Shinkawata (U.S. 5,796,136) Figure 1. Additionally, claims 28-30, 39-41, 44-46 and 56 were rejected under 35 USC § 102(e) as being anticipated by Roh (U.S. 6,071,770) Figure 4f. However, the rejection stands moot with the cancellation of claims 28-38, and the amendment of independent claims 39, 48, 51, and 56.

These claims and their dependents are believed to distinguish over Shinkawata and Roh at least by virtue of requiring “a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess.” In Shinkawata’s Figure 1, lower electrode 13 appears to be flush with an upper surface of insulator 18, and to lack a recess. And, in Roh’s Figure 4f, the only portion extending above and below the upper surface of insulating film 21 is TiW layer 26; however, TiW layer 26 lacks the requisite recess. Accordingly, applicant respectfully requests reconsideration and withdrawal of the 102 rejections based on Shinkawata and Roh.

Response to §103 Rejection

Claim 47 was rejected under 35 USC § 103(a) as being unpatentable over Shinkawata in view of Ma et al. (U.S. 5,973,344). This rejection stands moot in view of the amendment of claim 39.

Conclusion

In view of the amended claims and foregoing remarks, applicant respectfully requests reconsideration and withdrawal of the rejections. Moreover, applicant invites the Examiner to telephone its patent counsel Eduardo Drake at 612-349-9593 to facilitate further prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

PIERRE C. FAZAN ET AL.

By their Representatives,

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Date

8 May 2001

By

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 8th day of May, 2001.

Name

Signature



N 09/489,954

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Pierre C. Fazan et al. Examiner: Donghee Kang
Serial No.: 09/489,954 Group Art Unit: 2811
Filed: January 24, 2000 Docket: 303.434US2
Title: METHOD FOR FORMING A STORAGE CELL CAPACITOR COMPATIBLE
WITH HIGH DIELECTRIC CONSTANT MATERIALS

CLEAN VERSION OF PENDING CLAIMS

3 TOTAL PAGES

39. (Amended) An electrode comprising:

- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and
- c) a third portion overlying said second portion and, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion are different materials.

40. The electrode as specified in Claim 39, wherein said second portion and said third portion are different materials.

42. The electrode as specified in Claim 39, further comprising a fourth portion interposed between said first and said second portions.

43. The electrode as specified in Claim 42, wherein the fourth portion reduces contact resistance between said first and said second portions.

44. The electrode as specified in Claim 39, wherein said first portion is a silicon contact.

45. The electrode as specified in Claim 39, wherein said second portion is a diffusion barrier layer prohibiting diffusion of atoms between said first and said second portions.

46. The electrode as specified in Claim 39, wherein said third portion is an oxidation resistant layer.

47. The electrode as specified in Claim 39, wherein said insulative layer surrounds a lower sidewall of said third portion.

48. (Amended) A dynamic random access memory device comprising:
an electrode which comprises:

- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer

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surrounds a sidewall of said second portion; and

c) a third portion overlying said second portion and, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion are different materials.

49. The electrode as specified in Claim 48, wherein said second portion and said third portion are different materials.

50. The electrode as specified in Claim 49, wherein said first portion and said third portion are different materials.

51. (Amended) A dynamic random access memory device comprising:
a capacitor which comprises:

a) a first portion formed in an insulative layer;

b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and

c) a third portion overlying said second portion and, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion are different materials.

52. The electrode as specified in Claim 51, wherein said second portion and said third portion are different materials.

53. The electrode as specified in Claim 52, wherein said first portion and said third portion are different materials.

54. The dynamic random access memory device as specified in Claim 51, further comprising:
a) a dielectric layer overlying said third portion; and
b) a cell plate electrode overlying said dielectric layer.

55. The dynamic random access memory device as specified in Claim 51 further comprising a transistor.

56. (Amended) An electrode comprising:

a) a contact formed in an insulative layer;

b) a diffusion barrier portion overlying said contact, said insulative layer surrounding a sidewall of said diffusion barrier portion; and

c) an oxidation resistant portion overlying said diffusion barrier portion and, extending above and below an upper surface of said insulative layer, and including a recess, said diffusion barrier portion configured to inhibit diffusion of atoms between said contact and said oxidation resistant portion.

57. The electrode as specified in Claim 56, further comprising a reducing contact resistance portion interposed between said contact and said diffusion barrier portion, said reducing contact resistance portion configured to reduce a contact resistance between said contact and said diffusion barrier portion.

88. An electrode comprising:

- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and
- c) a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion respectively consist essentially of polysilicon and tantalum.

89. The electrode as specified in Claim 88, wherein said third portion consist essentially of platinum.

90. An electrode comprising:

- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and
- c) a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion respectively consist essentially of polysilicon and titanium silicide.

91. The electrode as specified in Claim 90, wherein said third portion consist essentially of platinum.

92. An electrode comprising:

- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and
- c) a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess; and
- d) a fourth portion interposed between said first and said second portions, wherein said first, second, third, and fourth portions consist essentially of polysilicon, tantalum, platinum, and titanium silicide.



An electrode comprising:

- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and
- c) a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion respectively consist essentially of polysilicon and tantalum.

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- c) a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess, wherein said first portion and said second portion respectively consist essentially of polysilicon and titanium silicide.

91. The electrode as specified in Claim 90, wherein said third portion consist essentially of platinum.

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- a) a first portion formed in an insulative layer;
- b) a second portion overlying the first portion, wherein said insulative layer surrounds a sidewall of said second portion; and
- c) a third portion overlying said second portion, extending above and below an upper surface of said insulative layer, and including a recess; and
- d) a fourth portion interposed between said first and said second portions, wherein said first, second, third, and fourth portions consist essentially of polysilicon, tantalum, platinum, and titanium silicide.

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